

3.16 Activity

Determining Lung Volumes

Many factors can influence lung capacity and breathing rates. In general, the volume of a normal breath and your maximum lung volume can be used as indicators of health. In this activity, you will measure lung volumes that correspond to different depths of breathing.

Questions

- What is your normal breathing volume?
- What is the maximum volume of air that you can exchange in your lungs?

Materials

spirometer with disposable mouthpieces
nose plug (optional)



NEVER INHALE through the spirometer mouthpiece.
Make sure mouthpieces are not shared.

Procedure

- Set the spirometer gauge to zero, and then place a new, unused mouthpiece in the spirometer.
- Before using the mouthpiece, relax and allow yourself to get into a regular, relaxed breathing pattern. Then, **AFTER** inhaling normally, place the mouthpiece in your mouth, hold your nose closed, and exhale normally through your mouth.
 - Read the gauge on the spirometer and record the value as your tidal volume in a data table.
- Reset the spirometer gauge to zero. Inhale and then exhale normally. Now, **AFTER** exhaling normally, place the mouthpiece in your mouth and forcibly exhale all of your remaining air.
 - Record this value as your expiratory reserve volume in your data table.
- Repeat step 3, but this time take a deep breath and then exhale fully, forcing the maximum volume of air from your lungs.
 - Record this value as your vital capacity in your data table.

- Use the relationships displayed in **Figure 1** to calculate your inspiratory reserve volume. Record this value in your data table.
- Collect data from at least two other students and place them in your data table.

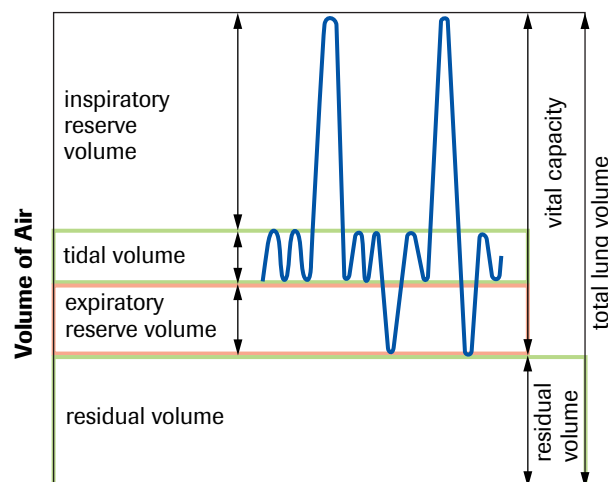


Figure 1
Lung volumes and breathing depths

Analysis

- Examine **Figure 1** showing the various relationships between lung volumes and breathing depths. Note that the residual lung volume is the volume of air remaining in the lungs even after you have exhaled completely.
 - What is your “normal” breathing volume?
 - What is the maximum volume of air you can exchange?
 - How do your volumes compare with those of your classmates?
 - How might body size, gender, or health account for these differences?

Synthesis

- How might living at high altitudes influence tidal volume and/or vital capacity? Explain.
- What types of activities do you think would most contribute to increasing your vital capacity? How might this improve your general health?